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Home Range and Movement of Five Mule Deer in a Semidesert Grass-shrub Community

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Abstract

The home ranges of five desert mule deer (*Odocoileus hemionus crooki*) were determined on the Santa Rita Experimental Range between May 1975 and June 1976. Home range averaged 2.9 square miles, but varied for individual deer by season, sex, and age class. The area of activity within the home range was smallest during the spring and early summer and largest during the winter breeding season. The collared deer were found to be nonmigratory and restricted to the Experimental Range. Seasonal movements were within the home range. Minimum movement between consecutive days was approximately one-half mile in the spring and summer. Breeding season activity and disturbances by humans altered the normal movement pattern.

Keywords: Mule deer, deer behavior, deer home range.

Management Implications

Range scientists have advocated the control of shrubs to restore the potential productivity of perennial grasses (Parker and Martin 1952, Cable and Martin 1964, Reynolds and Martin 1968, Martin and Cable 1974). However, extensive shrub overstory removal would likely decrease the value of this habitat for deer. Limited vegetation conversion, though, may enhance range use by both livestock and wildlife. On suitable sites, small dispersed openings could increase forage yields while providing additional diversity in the habitat for deer. The availability of water on the Santa Rita Experimental Range during dry periods appeared to be adequate for efficient use of the habitat by deer.

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Introduction

Management of habitat for a given species of wildlife requires a knowledge of food, cover, and space requirements of the species. Research documenting the food habits of desert mule deer in the semidesert grass-shrub habitat on the Santa Rita Experimental Range has been published by Short (1977). This study was initiated to complement Short's work by (1) determining home range and movements of deer in a semidesert habitat, and (2) describing the influences of environmental factors on the seasonal patterns of use and activity.

Study Area

The study area was the 50,000-acre Santa Rita Experimental Range, 30 miles south of Tucson, Ariz. (fig. 1). Topography is a broad sloping bajada crossed by numerous dry shallow washes which drain northwest toward the Santa Cruz River. Elevations range from 2,800 to 4,500 feet. The Experimental Range is bordered on the east and south by the Santa

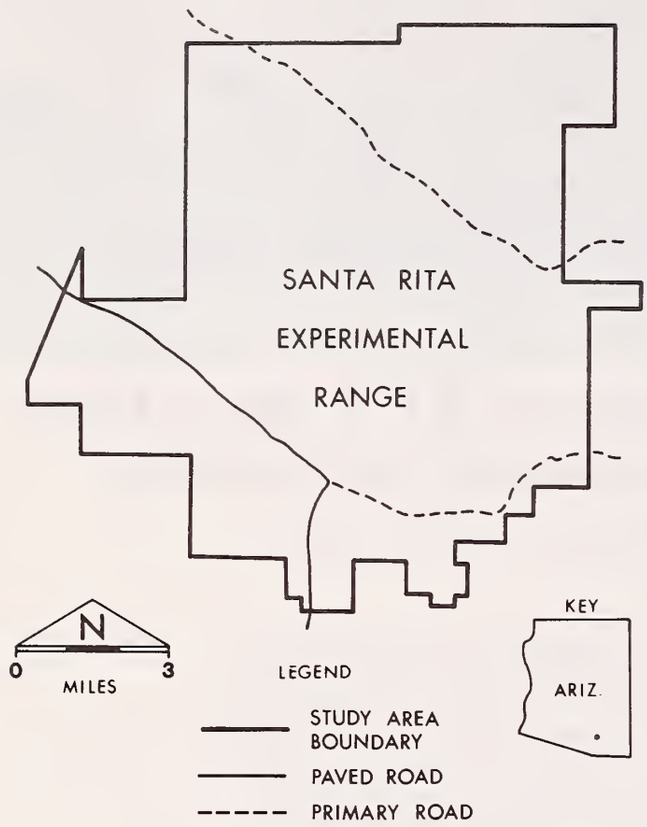

Figure 1.—Location of study area.

Rita Mountains, which rise abruptly to over 9,000 feet in the southern section. Irrigated agricultural land in the Santa Cruz Valley lies 2 to 3 miles west.

Annual rainfall ranges from 10 to 20 inches, with more than half occurring during the July through September rainy season. Winters are mild, and summers hot with humid periods during thunderstorms. An extensive pipeline system supplies permanent water to 20 experimental pastures. Stock ponds supply intermittent water for livestock and wildlife at other locations.

Vegetation is a sparse understory of perennial grasses overtopped by invasion stands of velvet mesquite (*Prosopis juliflora* var. *velutina*), cactus, and other shrubs. In general, vegetation increases in density with increasing elevation. Overstory vegetation between 3,200 and 3,600 feet is dominated by mesquite, burroweed (*Happlopapus tenuisectus*) and jumping cholla (*Opuntia fulgida, O. versicolor,* and *O. spinosior*). Engelmann pricklypear (*O. engelmannii*), catclaw acacia (*Acacia greggii*) and false mesquite calliandra (*Calliandra eriophylla*) are more prominent species at higher elevations (Martin and Reynolds 1973).

Areas below 4,000 feet typify desert mule deer habitat. Within this habitat, major food items are the foliage of leguminous trees and shrubs, fruit of cactus, notably barrel cactus (*Ferocactus wislizeni*), and seasonal forbs (Short 1977). Vegetative cover above this elevation grades into an oak-woodland type in the foothills and mountains.

The Experimental Range is classified as a Wildlife Area by the Arizona State Game and Fish Commission. With the exception of experimental hunts in 1954, 1964, and 1968 through 1972, the area has been closed to deer hunting since the 1930's[2].

Methods

Five deer were captured and fitted with radio collars to monitor daily and seasonal locations and activities. Collars consisted of a transmitter, antenna, and battery enclosed in Urelane (Furane Plastics, Inc.)[3] and attached to a 2-inch-wide leather strap. Collars were wrapped with colored vinyl electrical tape for field identification. An additional 3- x 5-inch fluorescent orange tag with black numerals was placed on the collar. The completed collar weighed from 1 to 3 pounds. Handheld three-element yagi and dipole directional antennas were used with a portable receiver to monitor signals.

A compass was used to determine the bearings of radio signals from hilltops, road intersections, and fence corners. At least two bearings were recorded for each deer location. On occasion, fixed-wing aircraft were used to locate deer whose signal was not heard on the ground. Intersecting signal directions were used to plot deer locations on a topographic map. The outermost points were then connected to delineate the area of activity.

Home ranges were determined by the minimum area method (Mohr 1974). For deer tracked throughout several seasons, home ranges were subdivided to represent areas of seasonal use. Plotted locations were examined to determine habitat use and movement patterns by season. For successive days of location, the linear distance between location points was measured as an approximation of minimum daily movement.

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[3]*Trade names and company names are used for the benefit of the reader and do not imply endorsement or preferential treatment.*

Table 1.—Home range estimates for five radio-collared deer.

Deer Number	Age and Sex	Transmitter Life (2 days)	Number of Locations	Home Range (mi^2)	Time Period
1	Adult, female	78	40	2.8	June 12, 75-Aug. 28, 75
2	Adult, male	[1]378	27	2.4	May 26, 75-Oct 26, 75
				4.8	May 26, 75-Jun. 06, 76
3	Fawn, female	[1]131	25	1.5	Jan. 28, 76-Jun. 6, 76
4	Adult, male	[1]78	8	1.8	Mar. 20, 76-Jun. 6, 76
5	Yearling, female	220	27	2.8	Jun. 25, 75-Aug. 21, 75
				4.1	Jun. 25, 75-Mar. 16, 76
			127	X=2.9	

[1]*Transmitter was functioning at the termination of study.*

Results

Deer were tracked from May 28, 1975 to June 6, 1976. Home range sizes were estimated using 5 points of capture, 38 sightings, 69 ground locations, and 15 locations from the air. Home ranges for individual deer varied by season, sex, and age class. Areas ranged from 1.5 square miles for an adult doe and two fawns, during January to June, to 4.8 miles for a mature buck over a 12-month period (table 1).

The home ranges were generally elliptical with variable orientation. Each home range included two or more permanent watering areas along the periphery. In contrast, Hanson and McCulloch (1955) found water sites in Arizona brushlands were often in the center of a home range when suitable habitat was available in the surrounding area. Observed home ranges were intermediate in size relative to those reported for nonmigratory mule deer in other locations in the Southwest (Dasmann and Taber 1956, Hanson and McCulloch 1955, Swank 1958, Clark 1953).

Our data suggest that deer at Santa Rita may occupy different sized areas and sections within their home range in different seasons. The area of activity was smallest during the spring and early summer. Following summer rains, the home range began to enlarge, and continued to increase or shift during the fall and winter, reaching maximum during the breeding season. With exception of the rut, this seasonal pattern was similar to findings in the Tucson Mountains (Clark 1953).

Although size of areas occupied during seasons varied, the area of summer activity seemed to represent the core of the home range (fig. 2). Bucks occupied a larger home range on a yearly basis than does. Other home range studies indicate this same pattern (Clark 1953, Dasmann and Taber 1956, Swank 1958).

Movements

Movements of collared mule deer on the Experimental Range were not extensive. Deer were essentially nonmigratory and occupied a restricted home area all year. Other studies in the Southwest have reported similar results

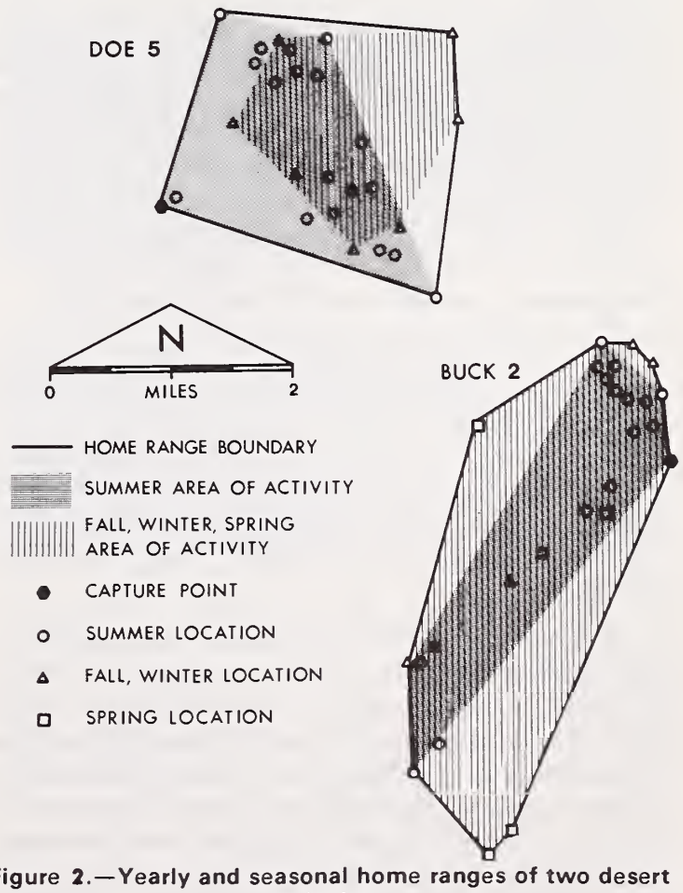

Figure 2.—Yearly and seasonal home ranges of two desert mule deer.

Table 2.—Average minimum deer movement between consecutive days and within single days.

Deer	Period	Number Consecutive Days	Aver. Movement Between Consecutive days *(mi.)*	Range *(mi.)*	Number of Days	Aver. Movement Within a Single Day *(mi.)*	Range *(mi.)*
1	Jun.-Aug.	12	.45	.1-1.0	10	.25	.1-.63
2	Jun.-Jul.	5	.46	.2-.6	1	[1]	
3	Mar.-Apr.	3	.56	.35-1.1	2	.28	.15-.4
5	Jun.-Jul.	4	.45	.2-.65	2	.62	.25-1.0
All		24	.49	.1-1.1	15	.29	1-1.0

[1]*Insufficient sample size.*

(Clark 1953, Truett 1971, Lang 1957). Seasonal movements were primarily shifts within the home range. Movements outside of the home range to adjacent areas of greater forage or water availability were not observed.

Throughout the year, deer fed and watered in mornings and evenings. Deer usually bedded during the day, but could be seen feeding at all hours during the day in the winter. Areas of good cover, especially the dry washes, were used for bedding grounds in all seasons. Most watering in winter occurred in the mornings. Late evenings and nights were summer watering times.

Estimates of minimum daily movement between consecutive days and minimum movement within particular days were obtained from four collared deer (table 2). Minimum movement between consecutive days averaged about one-half mile during the summer of 1975 and spring of 1976. Daily deer movements from less than 1 mile up to 5 miles in the Tucson Mountains, depend on climatic conditions (Clark 1953).

Data obtained on daytime travels indicated half of the movement between consecutive days in the summer occurred during the daylight period. Our data show that the daily cruising radius for deer on the Experimental Range was less than the 1 mile average radius found in the Arizona chaparral (Hanson and McCulloch 1955).

During the rutting season, mule deer occasionally left their home range. Bucks in December and January were active and moving throughout the day. The movements of buck No. 1 reflected a tendency to venture beyond his home range. Despite an aerial search in January, this buck could not be found in or near the area he frequented during the summer and fall. He was not found in his home range until April—more than 1 month after the rut. Other studies indicate that bucks may travel a mile or more beyond their home range (Dasmann and Taber 1956). Dixon (1934) documented California mule deer movements of 10 miles during one night.

Factors Influencing Movements

Cover and Food

Most of the Santa Rita Experimental Range has sufficient shrub densities to provide concealment for deer. Pastures cleared of mesquite were an exception. The lack of cover on these areas restricted deer use during daylight periods. Numerous dry washes on portions of the Experimental Range with little cover were important. These drainages and their associated vegetation provided resting, feeding, escape, and travel cover for the five deer throughout the year. In addition, the relief in these areas afforded protection from weather. Although the washes comprised a small segment (approximately 3%) of the area, 33% (163) of all sightings were in wash areas.

Truett (1971) indicated deer used areas that had palatable forage, as a result of the effects of topography. However, selection of feeding areas based on the influences of relief was limited on the Experimental Range. The gentle topography at Santa Rita did not provide marked contrasts in slope and aspect as in studies by Truett (1971) and Anthony (1972).

Water Availability

Signs at water developments on the Experimental Range suggested that deer increased their water use in the dry periods of May-June and September-October. Observations, however,

did not indicate that deer concentrated near these water sources. Collared deer remained within 1 to 1-1/2 miles of permanent water during the dry periods; subsequent monitoring revealed that this distance was also the extent of their home range during wetter periods. Movements to areas of permanent water were evident, but did not require extensive adjustments in activities. On one occasion, the drying of a waterhole resulted in a doe shifting one-half mile to a new activity area with a more reliable water source.

Water distribution on the Experimental Range is better than the surrounding semi-desert habitat. The maximum distance from a permanent water source was 2.4 miles during the early summer, when many surface stock tanks were dry. After these tanks had been replenished by summer rains, the maximum distance was 1.9 miles (fig. 3). These seasonal changes in water availability did not have a noticeable impact on deer movement and did not limit their use of the habitat.

Weather

Deer were more active during the cooler parts of the day in the summer, and sought shelter in washes from the heat and sun during midday.

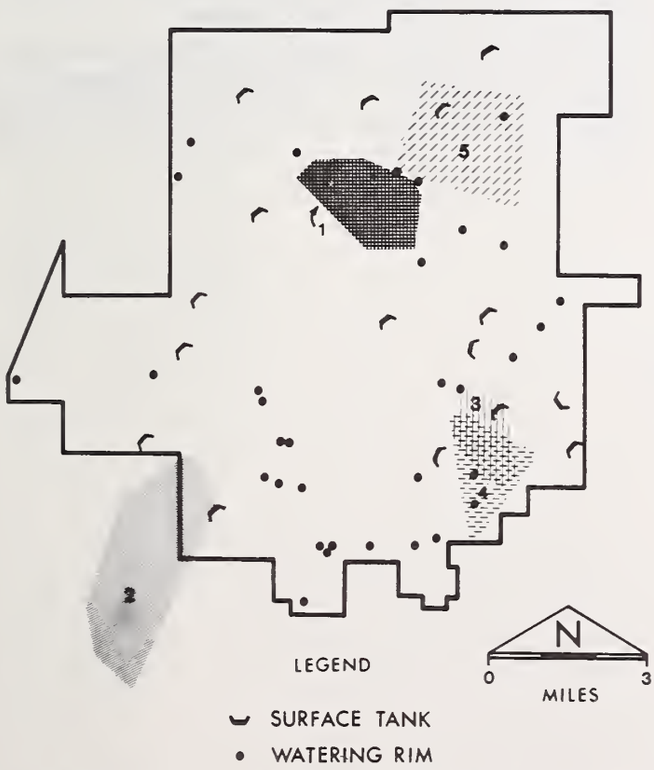

Figure 3.—"Minimum area" home ranges of five desert mule deer and water distribution patterns on the Santa Rita Experimental Range.

Deer were active throughout the day in the winter. The weather at Santa Rita apparently did not cause seasonal migrations, although Truett (1971) mentioned that topography often afforded this means of thermoregulation. The gentle and uniform nature of the topography on the Experimental Range limited the variety of exposures to accomplish these adjustments.

Human Disturbances

Following capture, one deer (No. 3) readily associated with others, and within several days, the deer groups appeared to return to their normal movement and activity patterns. Radio collars were assumed not to have a significant effect on the behavior or interactions of instrumented animals.

Humans caused deer movements. In many instances, radio locations were followed by attempts to sight and observe deer activities. Their reactions to these disturbances varied from a short run with little change in location, to movements of almost 2 miles during the period of 1 day. In some cases, movements resulted in deer returning to the same area a short time later, or in the case of extended travel, to a new area of activity. For example, doe No. 1 remained in an area 1,200 feet in diameter for 2 weeks despite five sightings that interrupted her activities during this time. In another instance, buck No. 2 shifted his area of activity 3-1/2 miles after several sightings. Provocation at this new location caused a return movement to the original area. This deer moved irregularly between these two areas.

The fall deer hunting season had a noticeable effect on deer movements and activities. On the Experimental Range, which was closed to legal deer hunting, other research personnel reported an influx of deer to areas within the range boundaries. The movements of buck No. 2 reflected this apparent deer response to hunting. He was located in an area 2 miles outside the Experimental Range boundary 1 week before the beginning of the hunt. Two days before the season and during the first 3 days of the 9-day hunt, he could not be located within the portions of his home range outside the Experimental Range. Hunters who were questioned did not report sighting this buck. One day after the season's end, he was located by aircraft on the Experimental Range within his home area. He remained in this vicinity for several weeks before leaving the Range again.

Livestock Grazing

Seasonally, there was a potential for competition between livestock and deer for some forage items, such as mesquite beans, false mesquite (a highly preferred browse plant), and ephemeral forbs. At present, cattle are stocked to obtain approximately 40% use of the perennial grass resources (Martin and Cable 1974).

Presence of cattle did not appear to affect deer preference for a portion of their home range. The only disturbances which temporarily displaced the deer from their activity areas resulted from livestock movement at roundup time.

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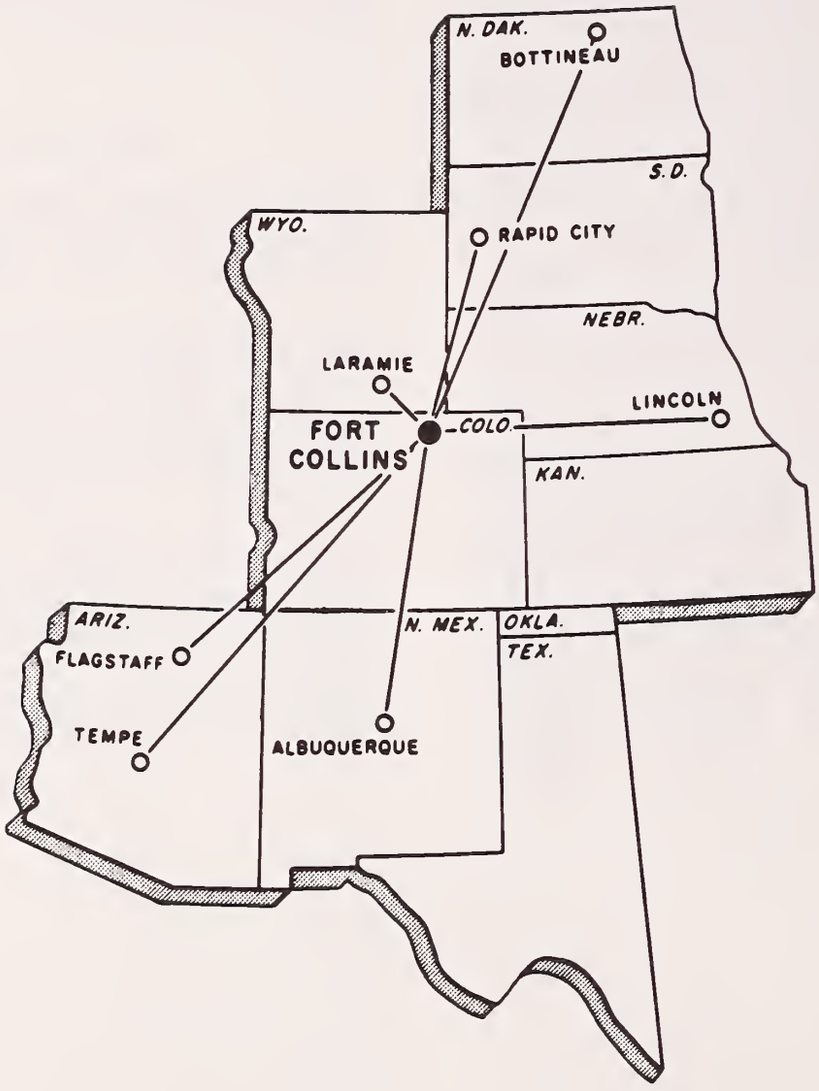
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